comment

Problem 1. A fast train needs to stop at 4 out of 11 possible stations. NO two chosen stations should be consecutive stations. How many ways can the four stations be chosen?

Problem 2. Twenty five of King Arthur's knights are seated at their customary round table. Three of them are chosen - all choices being equally likely - and are sent off to negotiate a deal with a dragon. Let P be the probability that at least two of the three had been sitting next to each other. If P is written as a fraction in lowest terms, what is the sum of the numerator and denominator?

Problem 3. There are two distinguishable flagpoles, and there are 19 flags, of which 10 are identical blue flags, and 9 are identical green flags. Let N be the number of distinguishable arrangements using all of the flags in which each flagpole has at least one flag and no two green flags on either pole are adjacent. Find the remainder when N is divided by 1000.

Problem 4. Let A = $\{1, 2, 3, 4, 5, 6, 7\}$, and let N be the number of functions f from set A to set A such that f(f(x)) is a constant function. Find the remainder when N is divided by 1000.

Problem 5. Prove that the following is an integer if n is an integer.

$$\frac{(n^2)!}{(n!)^{n+1}}$$

Problem 6. Show that the locus of the midpoints of the chords from a fixed point A on a given circle with center O is a circle with diameter OA.

Problems are from past AMC and AIME, AoPS books, and IIT entrance exam training videos.